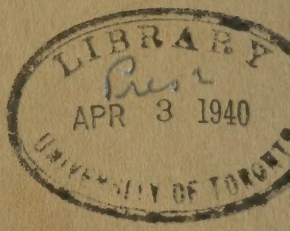
A

AMERICAN INSTITUTE
OF
CONSULTING ENGINEERS

Proceedings of the Annual Meeting
Held January 15, 1940



OFFICE OF THE SECRETARY
75 WEST STREET
NEW YORK

AMERICAN INSTITUTE
OF
CONSULTING ENGINEERS

Proceedings of the Annual Meeting
held at the University Club,
New York City, January 15, 1940

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ANNUAL MEETING

of the

American Institute of Consulting Engineers

The Twenty-seventh Annual Meeting of the American Institute of Consulting Engineers, preceded by a dinner at 7.00 o'clock, was held Monday, January 15, 1940, at the University Club, 1 West 54th Street, New York City, Dr. Dugald C. Jackson, President of the Institute, presiding.

The following members were present:

Howard C. Baird
R. E. Bakenhus
F. A. Barbour
E. B. Black
Clinton L. Bogert
Albert M. Brosius
George W. Burpee
Ralph H. Chambers
John N. Chester
J. F. Coleman
William P. Creager
Hardy Cross
George Conrad Diehl
Herman F. Doeleman
Charles H. Dolan, II
James Forgie
George B. Gascoigne
Gavin Hadden
Alonzo J. Hammond
Shortridge Hardesty
Philip W. Henry
W. W. Horner
William O. Hotchkiss
Otis E. Hovey
E. E. Howard
John P. Hubbell
Harold W. Hudson
Irving V. A. Huie
Dugald C. Jackson
L. Alfred Jenny
Daniel W. Mead
E. R. Needles
George A. Orrok
William M. Piatt
Malcolm Pirnie
Carlton S. Proctor
Henry E. Riggs
Harry S. Rogers
Ralph R. Rumery
Thorndike Saville
Frederick W. Scheidenhelm
Charles F. Scott
Albert V. Sielke
Ole Singstad
L. J. Sverdrup
James L. Tighe
Edwin F. Wendt
Harold E. Wessman
Robert Spurr Weston
Charles S. Whitney

There were also present the following guests:

F. H. Bair
Percy E. Barbour
Waldo G. Bowman
W. W. Comfort
C. H. Cunningham
C. E. Davies
P. H. Daggett
Ray P. Diehl
S. M. Ellsworth
F. Malcolm Farmer
Frederick M. Feiker
James L. Ferebee
David Graham
C. L. Hall
H. H. Henline
W. R. Holway
R. V. Hyland
J. P. Jackson
Charles T. Leeds
T. Keith Legaré
George L. Lucas
E. J. McGrew, Jr.
Albert B. Newman
John I. Parcel
A. B. Parsons
E. E. Paul
J. P. H. Perry
Emil H. Praeger
A. C. Purdy
Donald H. Sawyer
F. E. Schmitt
George T. Seabury
H. R. Seely
William J. Shea
Roscoe H. Suttie
H. C. Tammen
George M. Thomson
S. L. Tyler
A. D. Weston
W. W. Young

President Jackson: Gentlemen: There are certain lines of thought that we must go through, a brief bit of business, before we get to the delight of the evening. The first thing is the roll-call, but it need not be taken orally tonight, because the Secretary tells me that he is taking the sheet of attendance and checking it off.

The reading of the minutes of the preceding annual meeting can be dispensed with, because they were published in the proceedings last year and every member, I hope, has read them; but, at any rate, if there is no objection expressed they will be approved as printed. There being no objection, the minutes of the last annual meeting are so approved.

Formal notice of this meeting was sent out to the members, so that this is a formal annual meeting of the Institute as well as an annual dinner. At each annual meeting we announce the election of three members of the Council. The Nominating Committee was duly appointed and it did its work. Admiral Bakenhus, in whose perfect fairness we can completely rely, was Chairman of that Committee. The Committee nominated Mr. Frank A. Barbour, of Boston, Mr. Otis E. Hovey, of New York, and Mr. Malcolm Pirnie, of New York. (Applause.) The nominations have been

made, the names were sent on ballots to the members. The tellers will now report the result of the ballots. Mr. Baird, who is the chairman of the tellers, will report.

MR. BAIRD: The result of the ballot was: Mr. Barbour, 80; Mr. Hovey, 80; Mr. Pirnie, 79. (Laughter.)

PRESIDENT JACKSON: The ballot has elected the nominees and the Chair so declares.

There is still another ballot to be dealt with. We have in our statutes a requirement that the Council shall meet on the first Wednesday of every month. However, for some years, the January Council meeting has been held right after the election. It will be held tomorrow, after the Annual Dinner. And we have held no Council meetings in July and August. We recently wakened up from our lethargy and decided it would be a good idea to amend the statutes to meet our practice. Therefore, an amendment was offered making the regular meetings of the Council at the times in which they are now being held.

Mr. Baird will announce the ballot on that.

MR. BAIRD: Total number of ballots was eighty-three, all in favor.

PRESIDENT JACKSON: Gentlemen, the Chair declares the amendment adopted.

The Secretary does not look upon it as appropriate to make a report at these meetings. He says he makes ten of them to the Council during the year which go to the members with the monthly Council reports. In view of Secretary Henry's labors for us, since he asks to be relieved of making a report this evening, we will forgive him the oral report, but give him "leave to print."

With respect to the finances, naturally, a relatively small society doesn't have such a large amount of money that anyone is anxious to abscond with it. But the Secretary is also the Treasurer. The statutes say there shall be a Secretary and a Treasurer, but that they may be one man, and that has been the habit of the Institute for some years. The Secretary and Treasurer is not only substantially irreplaceable as a Secretary, but he is a man of thrift and believes in a balanced budget. We came out with $205.24 in the black this year. (Applause.)

Now I want to read just a few regrets to you, just a few. I can't read many. I want first to read a telegram from one of the men in Colonel Perring's firm in Baltimore. And this is par-

ticularly significant because Colonel Perring was acquainted with President Comfort, one of our speakers this evening and served as our intermediary. Naturally, he would wish to be here. This is the telegram:

> "Henry G. Perring ill with slight attack of influenza and unable to attend tonight or tomorrow. Please tender his regrets to Dr. Comfort."

And I know he means that also to the Institute. Colonel Perring is a member of our Council.

As I have spoken about illness, I will point out that a telegram has come in from Mr. Poland, of Washington, who wrote saying he was going to be here unless the illness of his son failed to show relief under the care of the doctor. He wires:

> "Greatly regret not able to attend meeting tonight."

which indicates that the illness is severe, which we also regret.

And then we have another case of illness; I'm not going to go through regrets generally, but this is another case of illness. We have here the regrets from one of our Past Presidents, Frederick Fay, of Boston. He says:

> "Sorry not to get over to the annual meeting, but I am on a much restricted schedule, three or four days a week at the office, with travel practically eliminated. At this pace I am keeping in good health. Kindest regards."

That was to Secretary Henry.

Now I am going to read you just two more regrets. They are of members that have come into the society within four years. One is Mr. Henry W. Buck. He says:

> "In reply to your card,

(that was the notice of the meeting)

> I find that it will be impossible for me to attend the annual meeting of Institute next Monday. This is the first time I have missed an annual meeting since I became a member, and you may be sure that I regret that it is necessary to do so."

Another one from another member that is rather recent, Mr. George Armstrong:

> "Regrettably, I now know that I shall be unable to attend dinner. I feel deprived by this disappointment, as I have

always enjoyed the dinners greatly, and regret that I cannot join the fellowship of that evening."

The older members all feel the same way, I am sure.

Now, gentlemen, I'm going to show off our guests who are at the head table.

This makes me think of the definition of chivalry (and our situation is a bit like it) that came up in a school examination: "Chivalry is a man's attitude toward a strange woman."

Now, I'm going to start in chivalrously with these gentlemen. They are not strangers to me, most of them, but at the same time I'm going to take the attitude of chivalry.

We begin with Mr. Purdy, President of the Association of Consulting Chemists and Chemical Engineers. Mr. Purdy, won't you kindly rise and let these people see you? (Applause.)

Mr. Otis Hovey, who is Director of the Engineering Foundation. (Applause.) Mr. Hovey is one of our old-time members.

Mr. Farmer, President of the American Institute of Electrical Engineers. (Applause.) Now, since Mr. Farmer, being an electrical engineer, has my warm friendship, I'll say, look how handsome he is!

Now, the next man listed, the President of the American Institute of Mining and Metallurgical Engineers, Mr. Donald B. Gillies, had accepted the invitation, but something must have occurred which has prevented him from coming; I hope it is not illness. But this society is represented by Mr. Parsons, the Secretary. And let's see Mr. Parsons. Where is he? There he is. (Applause.) I wanted to prove to you that the society does exist. (Laughter.)

Now, this man (indicating Dr. Hotchkiss) I'm going to hold back on a little bit—this is chivalry, you notice—and this man (indicating Dr. Comfort) I'm also going to hold back on a little bit.

And now we come to Mr. Sawyer, President of the American Society of Civil Engineers. (Applause.)

And now we come to Mr. Hammond, one of our members, who is President of American Engineering Council. (Applause.)

The next man is the man whom you call "Jack." As I told you last year, somehow or other whenever I look at him I always say, "Mr. Perry." (Applause.) He is Chairman of the Engineers' Council for Professional Development, and I assure you that he is doing a grand job.

We were to have Mr. Zurmuhlen, President of the New York State Society of Professional Enginers, but unhappily he is in the hospital. Consequently, he is not here. Thus we now come to Colonel Barbour, Secretary of the Mining and Metallurgical Society of America. (Applause.)

Well, this all shows the solidarity of engineering. We, who are members of A. I. C. E., come into all branches. These Presidents and Secretaries at the head table are not all members of our Institute, but all of us are members of one or more of their societies.

We also have here the Secretary of the American Society of Mechanical Engineers, Mr. Davies. Mr. Seabury, Secretary of the American Society of Civil Engineers, was here, but he found it needful to return to his desk. Mr. Henline, Secretary of the American Institute of Electrical Engineers, is here. Mr. Tyler, Secretary of the American Institute of Chemical Engineers, is here. Dr. Webster Jones, President of the American Institute of Chemical Engineers, was not able to come from Pittsburgh, so, Mr. Tyler, won't you show that the society is alive? (Applause.) Mr. Feiker, Secretary of American Engineering Council, is here. (Applause.) As soon as Mr. Hammond came along as President of A. E. C., Mr. Feiker looked at him and said, "Well, here is a real grand man coming in, and therefore, I will become the dean of an engineering school." So Mr. Feiker is going to abandon Mr. Hammond.

And that is that for our head table list. I hope that you have looked at the gentlemen and found that they are all good-looking.

Dr. Hotchkiss seems to think Secretary Davies ought to be shown. Colonel Davies, please stand up. (Applause.)

MR. DAVIES: Mr. Chairman, I come every year, and I don't feel like a guest any more. I feel like one of the crowd, so I don't see why I ought to be introduced.

PRESIDENT JACKSON: I apologize for an oversight. I ought to have had Mr. Davies stand up with the others to represent his Society because its President has been, I take it, in San Francisco and couldn't get here.

MR. DAVIES: Mr. Chairman, our President is ill in the hospital in Wilmington. I spent two hours with him yesterday, and he asked me to express his regrets.

PRESIDENT JACKSON: Illness is worse yet. Please have him understand that the regrets are ours.

Dr. Rogers: That isn't why Hotchkiss wanted Davies to stand up. He wanted him to stand up because he's from R. P. I.

Dr. Hotchkiss: You would give me away.

President Jackson: Gentlemen, it now is my duty and pleasure to say a few words about the American Institute of Consulting Engineers, but they won't be many, since I know that you all thirst to hear the speakers of the evening.

First, let me express to the members of the Institute my very great appreciation for the honor and pleasure of having served you as President for two years. It is really an experience that is very delightful, and the extension of acquaintances with really notably able men is worth every such effort.

My only regret is that I fear that the Institute has made no sufficient advances as compared with the state in which President Wendt left it to me. Our membership is slightly larger, very slightly larger, than it was last year; and it was a little larger last year than it was the preceding year. But why can not we get busy and see that we grow a little more? Instead of being a hundred and thirty strong, ought we not to be two hundred and fifty? We cannot be truly large in numbers and yet be within the limitations in respect to eligibility, but we might be two hundred and fifty and be more influential for the welfare of the profession.

Again, are we expressing our full and appropriate influence on professional welfare? If we were a little larger, perhaps we could do it more fully.

As citizens of the nation, are we expressing our influence? Certainly as local citizens we are. I must say that each member of the Institute with whom I am particularly acquainted is a man who is serving his immediate community with a great deal of fidelity and with much value to the community.

In respect to this matter of citizens of the nation, we have a Development Committee that keeps coming forward with good ideas. At the present time that Committee, under the chairmanship of Mr. Diehl, is proposing that we see whether we cannot influence some of the things that would help the problems of stabilizing political thought. If we started discussing that question this evening, we would never have the pleasure of listening to our speakers. Therefore, the matter is not coming before you for discussion, but, as I have called it to your attention so as to make it formal, it will be laid before the Council tomorrow noon.

I am not going to discuss war and its repercussions. Every

engineer of competency, I feel pretty sure, recognizes of war that it is inhumane on account of the sorrow, hardships and unhappinesses it brings; that it is wasteful in material, wealth, and in man power and woman power; and that it is a very inefficient manner of adjusting differences internationally. We have, however, in this nation risen to combat in support of liberty and democracy in the past, and if necessary we will again do so. But we should remember that it was our government that urged the nations of the world to join in the Kellogg-Briand Pact, in which the various nations agreed to refrain from war as a matter of national policy. And we still stand true to such treaties.

The Council of the Institute held ten monthly meetings, preceded as usual in the case of nine well-attended luncheons of members and guests, at each of which some valuable topic was discussed. The subject of the desirability and serviceability of engineering audits of physical property in both government and private corporation ownership was considered of sufficient importance to receive the attention of three meetings. In these the engineering aspects of the subject were successively outlined for discussion at two meetings by our members, Messrs. Ammann, Burpee, Diehl and Singstad, and at the third the accounting relationships were outlined by Mr. Wellington, of the firm of Scovell, Wellington & Co. At a somewhat later meeting the subject was collaterally discussed by Hon. Thomas C. Desmond, Senator of the State of New York, who outlined the objectives of his bill which is now before the New York State Legislature and which he calls a public efficiency bill. Active discussion arose at each of these meetings. The gist of the addresses were sent to our members with reports of the Council meetings.

The members at one of these lunches unanimously proposed that the Institute should signalize the birthday of Secretary Henry and the fifteenth anniversary of his election as Secretary, by presenting him with a token of appreciative regards. This was duly authorized by the Council and a beautifully executed token prepared by a committee, consisting of Messrs. Dolan, Davies, Diehl and Forgie, was presented to him. It reads as follows:

> "The Council and Members of the American Institute of Consulting Engineers express by this token their congratulations on the celebration of your seventy-fifth birthday and convey to you this tribute of their individual and collective friendship and affectionate regard.

"They further express their appreciation of your many years of service to the Institute, to which you have devoted the same notable efforts which earned you a distinguished position as a consulting engineer. May we hope for many more years of such fruitful relations."

The various valuable committees elected by the Institute or appointed by the Council performed their services in the usual admirable manner, thus laying our membership and the profession in general under debt to them.

Now we come to the sad part of my duty to this meeting, which is the announcement of deaths of cherished members. I called your attention last year to the fact that, if the deaths announced at that time could be taken as a fair illustration, membership in this society spells longevity. Gentlemen, those of you who are eligible and are not in, I invite you to come in on the ground that you can rob the pension societies besides serving your profession.

But this time the record is not so good. The first death of the Institute year was that of Mr. Wilbur J. Watson, of Cleveland, who died in May at the age of sixty-eight, a man of distinguished standing in his community.

The next was that of Mr. J. Vipond Davies, of New York City, a grand engineer and a grand friend, who died in October at the age of seventy-seven. There we begin to talk about longevity.

The next was Mr. Francis C. Shenehon, of Minneapolis, who died in October at the age of seventy-eight, leaving behind him an enviable record in engineering education and engineering practice. The fourth was Prof. George E. Beggs, of Princeton University, who died in November at the youthful age of fifty-six—a short life, but very productive.

The accessions to membership have been announced to members in our Council reports as we have gone along and I will not here stop to read the names. Further details of the activities of the Institute will be given in the Secretary's report, which will form an appendix to these proceedings.

There is a problem before us of members who are charter members. The society was organized in 1910, and the charter members seem to be classified as those who became members from 1910 to 1913, the latter being the date of our incorporation. The charter members were of distinguished professional standing and in middle age or farther along. Some have retired and perhaps have taken to going to Florida for the winter, and therefore cannot

get to any of our meetings and cannot associate very much with the practicing engineers. This problem is to decide whether we should not, in a careful way, elect a few such to life membership, so that we may have the satisfaction of feeling that they may continue to have their hearts with us as we have our hearts with them. That will, perhaps, come up before the Council tomorrow.

My situation now reminds me again of a definition. It is a definition of syncopation that came out in a school examination. It is a definition that does very nicely for our case this evening, because it runs to this effect, that syncopation is an irregular progression from bar to bar. (Laughter.) Now, that doesn't sound very dry, does it? Well now, we have been syncopating over the Presidents this evening. We have had an irregular progression through this grand group of my associates at the head table. We will call them the cocktails or dry sherry. And we have two Presidents, who are to speak to us tonight and are not yet introduced. They will be the vintage wines.

At this point let me say something about the reason for the topic of the evening addresses, which relates to education. People say: Why should engineers care so much about formal education? We engineers all recognize it as a pretty good thing, but the real reason for its appearance this evening is that some of our various intimate friends began some time since to argue as to whether the engineering schools should do things this way or that way or some other way in their educational efforts. We of the Council thought maybe everybody would be interested to hear what two college presidents said about such things.

Now, as to the reason for the choice of voices to instruct the gathering: We chose one speaker who is a member of the Institute, who has been a scientist and engineer all his life, and a good part of his life president of an engineering school, either in Michigan or in New York State. He is now President of the Rensselaer Polytechnic Institute. Let me say that Mr. Henry's brilliant mind was the one that brought this subject forward, and he persuaded Dr. Hotchkiss to address us.

However, we do not wish to be one-sided when we discuss these topics, and Colonel Perring said, "Let's have a foil to Hotchkiss. And I can't think of anyone who can be better than the President of Haverford College. He will make a good foil." Thereupon he persuaded the President of Haverford College to speak to us this evening, which, I assure you, will be to the interest and pleasure of all of us.

The President of Rensselaer Polytechnic Institute will speak on "The Cultural Advantages of the Study of Engineering," and the President of Haverford College will speak on "The Cultural Advantages of the Study of Latin."

Further, let me say to you gentlemen that we are going to adjourn between half past ten and eleven. Secretary Henry says that, if they get excited, it's all right to run it to eleven.

After these two speakers are through, every member and every guest has the privilege of addressing the Chair and arguing his own thoughts about the matter. Moreover, Mr. Henry says that if anyone does not have an opportunity to express his views orally, he may express them by writing them down on paper and sending them to him as Secretary, and they will be published in the proceedings exactly as though they had been said here.

I hope before we adjourn we may be able to sufficiently calm the discussion, so that if either one of the speakers wishes to have two minutes of rebuttal we can give him a hearing. The discussion ought to be a lively one, if I may judge from what I have heard said from time to time on the subject by our members.

Now we come to the first speaker, a graduate of the University of Wisconsin, a geologist and a mining engineer. He has been State Geologist of Wisconsin, Chairman of the Highway Commission of Wisconsin—indeed, he succeeded in getting the State to organize that commission. He was President of the Michigan College of Mining and Technology for ten years, and has been President of the Rensselaer Polytechnic Institute since 1935. He is a writer and the recipient of many honors. His subject, as I have said, is "The Cultural Advantages of the Study of Engineering."

I now introduce to you personally our fellow member, the President of Rensselaer Polytechnic Institute, Dr. William O. Hotchkiss. (Applause.)

Dr. William O. Hotchkiss: Mr. President, President Comfort, my opponent in this joint debate, and Members of the Society and Guests: When I was in Wisconsin, I was a student of D. C. Jackson.

President Jackson: You honor me.

Dr. Hotchkiss: Out there, because of that fact in part, I was accepted as an equal by historians, by economists, by philosophers of ancient and modern languages, as well as by scientists.

When I came east to Rensselaer—in becoming acquainted with people in the East in college work, I found a rather tacit acceptance,

nothing ill-bred or unmannerly, that an engineer wasn't supposed to be possessed of anything of culture.

This acceptance of that superior position irked me a bit, and I was forced, in defense of my own mental integrity, to look into the subject and to decide for my own personal satisfaction whether I, as an engineer, was a man of culture or whether I was not. When I decided to dig into the matter I wrote a letter to my friend, Frank P. Graves, the Commissioner of Education in the State of New York. I dictated the letter to my secretary, asking Mr. Graves to recommend to me a history of education. I wanted to find out from a definite, formal history of education whether the general impressions that I had from my reading and studies were correct or not. Before my secretary had had time to transcribe the letter, there was laid on my desk a package. When I opened it there was a book sent to me with the compliments of Mr. Frank P. Graves, a new edition just off the press, of his book on the history of education.

I recalled my secretary and wrote another letter, and told Mr. Graves that, having such perfect evidence of his prevision, of his clairvoyant powers and no knowing what other black magic, I was going to treat him with the utmost of respect from that time on.

I read with much interest this *Student's History of Education.* I found my thoughts reinforced by the authorities on the history of education, and that, as most of us think when we think of anything of culture, much of it started in the great days of Greece. Then lived some of the finest of artists, of dramatists, of writers, of scientists in many lines. There was a flowering then of culture which we look back to as one of the great periods in culture in all of history.

After a period—it delights me as a mining engineer to say this —the silver mines down the Attic peninsula, which supplied the wherewithal that supported the great culture of ancient Greece, began to be worked out. The decline of Greek culture began with the decline of the Attic silver mines. Culture is a thing that must have wealth to flower upon. Culture as we think of it in Greece, great art, great philosophy, great literature, great drama, is a thing which cannot exist unless there is financial support back of it.

After Greek culture began to decline, the Romans carried the torch for a time. And then came the Dark Ages. After came the revival of learning, in central Europe. Again it pleases me to say

this, because the development of the mineral resources of central Europe produced the wealth that aided in this revival.

When the thoughts of men turned to culture, when wealth and leisure permitted, the sole repositories of the culture remaining from the time which tradition then, as today, pointed back to as the great days, were in the laboriously hand-copied manuscripts in the monasteries. Quite naturally these were written in Latin or in Greek, the languages of those cultures. And so when universities began to be formed in Europe two or three hundred years before the discovery of America, the only source to which students could go for the learning of the world was to these ancient manuscripts in the monasteries, and others that were similarly preserved.

To get what was in these manuscripts, these students had to know the classic languages. Latin and Greek were just as necessary to a student of those days as English is to one of our students at the present time. Latin and Greek were in those days the things which every university curriculum had to start with, because a man had to learn them as the key to unlock the culture preserved of the ancient days of Greece and Rome.

The courses in Latin and Greek were, therefore, exactly similar in their purpose to the courses in mathematics and physics and chemistry which we give to our engineering students at the present time. They were "tool" courses which unlocked and made available to the men of that time the culture, the great literature, the great art, the great drama and philosophy of the ancients.

With one of those curious inversions characteristic of human thought, since a man could not be an educated man unless he knew Latin and Greek, the tools through which he had to get education and culture, it came to be accepted that if a man knew Latin and Greek, therefore, he must be a cultured man.

Those old tool courses have continued almost to this generation as the heart of cultural education. Now, do not misinterpret me in what I say this evening as implying in the slightest that I do not believe in the value of those old tool courses, which unlocked the treasures of the ancients to the students of the Middle Ages. The liberal arts curriculum is a necessary curriculum. We need it. It is one of the avenues of culture today. We can't get along with just engineers, competent as we are. We have to have men who know other things than engineering.

I am reminded of a book which appeared last summer, written apparently by a professor of education, called *The Saber-toothed Curriculum.* It appeared just about the time of a big educational

meeting in Cleveland and, according to *Time*, which gave it about a page of review, it took the convention by storm.

It told of the beginnings of education in paleolithic times, how a man of that day who was thoughtful and analytical in mind, while he was engaged in catching fish for his family to eat, noticed his children at play, throwing pebbles at each other on the bank of the stream and thought, "Here, they would really enjoy being taught how to catch these fish as I catch them, with my bare hands," and, acting upon the thought, he began to instruct his children. Soon they were able to catch fish as well as he did, and his family grew and prospered more than any other family in the whole tribe.

And then he thought, "Here is another thing that we do. We have these little woolly horses that are about two feet high, that we kill for their hides and for their meat. We always have to kill them with a club. I'll teach the kids how to club the woolly horses." And pretty soon his children were adept at killing woolly horses.

Then there was one other principal occupation of the tribe. The one danger to which they were subjected was the saber-toothed tiger, which was apt to attack them as they went along the trails. Their protection against the saber-toothed tigers was to scare them with torches, with fire. And so he taught his children how to protect themselves against the saber-toothed tigers that lurked for them along the trails.

As his family prospered more than any other in the tribe, the neighbors soon began to observe the fact and to say, "Here, why don't we have him teach our children how to do these things?"

And so the first school was organized, and the curriculum, as all sacred curricula should be, was tripartite. There was "fish-snatching with the bare hands," there was "horse-clubbing," and there was "saber-toothed tiger scaring with torches."

After many generations came a change in the climate. The great glacial epoch began and a tongue of the ice sheet came into the valley where the tribe lived. The waters from it muddied the creek and they couldn't see to snatch the fish with their bare hands. And so the part of the curriculum that dealt with the catching of the fish with the bare hands was no longer a utilitarian curriculum. The tribe hungered until finally some inventive member of the tribe, fussing with some vines one day, plaited them into a sort of net, and the great idea came to him that if he made a large thing of that kind, perhaps he could scoop it through the muddy water and catch fish that way.

He proceeded to put the grand idea into effect, and found that they could catch more fish that way than they had ever been able to snatch with their bare hands.

The little woolly horses didn't like the change in climate, so they migrated long distances away, to a climate that suited them better. And so there were no little woolly horses to club, and the second part of the curriculum no longer was a utilitarian study.

The saber-toothed tigers were subject to pneumonia, and the glacial dampness and cold did away with all of them, so the third part of the curriculum no longer had any utilitarian value.

Generations went on. Finally some curious, thoughtful member of the tribe began to complain to the teachers: "Why can't you teach fish catching with nets, instead of these old outmoded studies that you are teaching?"

And the teaching fraternity, deeply shocked, replied with great dignity that those were the great and hoary traditions of education, and those subjects were taught for their cultural value. (Laughter.)

Now, I believe in liberal arts courses. Nothing that I say tonight should be taken as saying that I do not believe in them. My disbelief is in the statements of those who insist or claim that in those courses reside all of the cultural values of education. There are such, but fortunately, I do not believe there are so many as there used to be.

Perhaps the time has come when I should define to you what I think are the attributes of a cultured man. A definition of this sort is a very difficult one to make and, whatever I may say, probably every other man in the room would make one somewhat different. So I am going to give you permission to make your own definition as I go along, whatever it may be, and see whether we really seriously disagree or not.

I believe that a man should be credited with culture when he has four attributes: when he is able to see in their proper perspective the factors of the problems which lie before him; when he is able to have a true sense of the relative values of men and of things; when he is able to distinguish the true from the false; and the fourth, a summary of all, when he has those attributes of a well-balanced mind which enable him to live intelligently in his environment.

I think such a man is possessed of true culture. It follows that a man may know nothing of engineering and still be a cultured man. He may know nothing of Latin or Greek and still

be a cultured man. He may know nothing of any particular field of knowledge and still be a cultured man, if he does not look with scorn or envy upon the possessors of these other fields of knowledge. The truly cultured man does not look down upon any type of learning; nor does he look with envy. He merely looks upon those things as fields of learning which his time has not permitted him to acquire.

If you agree with me in that definition, then we can make it, I think, a bit more specific. A man is possessed of culture if he is able to view in their proper perspective the factors in the problems with which he has to deal; if he is able to tell the true from the false in the things with which he has to deal; if he has a true sense of the relative values of the men and of the things with whom and with which he is concerned; in short, if he has the qualities of a balanced mind which enable him to live intelligently in his environment.

There follows from that also what I believe firmly, that any field of knowledge is as cultural as any other field. I do not believe that there is any more culture in a complete awareness of the laws of the ancient Greeks and Romans than there is in the knowledge of the laws of nature, which are the laws of God which science has been able to discover and work out.

In all of my experience and observation I have never seen any curriculum nor any course which could turn out a cultured graduate. Culture comes from many sources. It comes vastly more from the teacher than it does from what he teaches. I believe it is perfectly possible to take a course in Latin from a teacher who is possessed of little or no culture and go out of that course with no culture. I believe it is possible for a man to take a course in calculus under an inspiring, cultured teacher and to go out of that course in calculus with a rare wealth of culture. And vice versa in both those cases.

I believe in the cultural value of science and engineering for another reason. Our engineering courses lay heavy burdens upon our students, of roughly twenty-five per cent. more time and effort and energy than is laid upon the student in the liberal arts curriculum. And few of our students fail to respond to that burden satisfactorily. I think that in itself a hard task well done is a cultural feature of very great importance. I believe that science and engineering offer a cultural value because of that, because the doctrine of softness has not penetrated to our engineering and science curricula as yet.

While that doctrine of softness is believed in by many educators at the present time, it is happily, I think, a decreasing number. I refer to the belief that a student should do only those things that he wants to do. It has been carried even farther in some cases, to the belief that a student should do only so much of those things he likes to do as he wants to do. That has led, in these days of a scientific civilization, to the abandonment of the requirement of mathematics in high schools, the fundamental of an understanding of anything scientific. It has resulted in the idea that there are many people who have peculiar inabilities: people whose minds are bright and good, who have intelligence and ability, but lack, peculiarly, the ability to understand mathematics.

I had a case of that in my own family to which I look back with pleasure. It may be of interest to you. Many years ago my small daughter, in the fifth grade, was bringing home failing marks in her arithmetic. One night, as was my custom, I went up to visit with her a little before she went to sleep, and got to talking about the poor marks she had been getting. The poor youngster finally broke down and cried and said the teacher had told her that she had no mathematical ability and could never get her arithmetic.

I started in to question her. I said first, "Do you think the teacher was right?" And, of course, as the teacher knew everything the thought had not entered into her mind to question the wisdom of the teacher's remark.

And then I made her analyze her arithmetic for me. I said, "What do you have to do in arithmetic?"

After a few leading questions she began to see what I had in mind, and she said, "Oh, you have to add."

I said, "Is that beyond your mental ability?"

No, she made mistakes in adding, but she was sure that wasn't beyond her mental ability, to learn not to make mistakes.

"What else do you have to do?"

Thus I led her through subtraction and multiplication and division. In each one of them she decided for herself that they were not beyond her mental ability. She went back to school and brought home high grades in her arithmetic from that time on.

Naturally, I don't believe in that doctrine of softness that would tell that poor child that there was a mountain of mental inability ahead of her so that she could never get her arithmetic. I have long felt that we teachers, from kindergarten to post-graduate classes, love to fatten our egos by presenting the *difficulties*

rather than the *simplicities* of our subject. We act as though we said, "See what a difficult subject this is, it's harder than anything, but I know it, I am a teacher of this difficult subject. Just think how smart I must be."

I think there is a cultural value in the study of engineering and science for a very much more fundamental reason. There is no asset that a man can carry away from his college course of so great importance to him as the habits of thought which he has acquired in that course. If he has acquired good habits of thought, he has the greatest possible benefit from his college course.

The difference between science and engineering courses on the one hand, and the liberal arts courses on the other is that each requires a fundamentally different sort of thinking. I like to compare that difference to the difference between the qualitative and the quantitative chemistry that you took as freshmen or sophomores. The student in qualitative chemistry is interested only in finding out if some particular substance is present in the unknown solution. Whether it is there in large quantities or small is wholly outside his interest. When he gets into quantitative chemistry, however, he has to find out whether that substance is there in large percentage or in small. He can't merely say, "There is much of it here" or "There is little of it here." He must say, "There is just a trace" or "There are twelve and twenty-seven hundredths per cent. of it here" or "There are nine and forty-eight hundredths per cent. of it here." And he must stake his reputation as a student on the quantitative accuracy of his determination.

The studies that make up almost the whole of the liberal arts curriculum are classic languages, modern languages, literature, philosophy, history, economics, with generally a requirement of one science; and the student too often looks around to find the course in science that will require the least effort on his part.

In every one of those subjects which I have mentioned, the habit of thought which is required is qualitative. You can't say that one poem or one piece of literature is twice as good as another. You can't say that it is one and fifty-seventh hundredths per cent. better. You can make no quantitative determination of a thing of that sort. It is impossible to think in quantitative terms in those studies. If you are dealing with history, there is no means of weighing the opinion of this authority in history as against that of an opposing authority, and saying that this one has twenty-five per cent. of the truth and this other has twenty-eight per cent. of the truth, and between them they have thirty-five per cent. of the

truth and don't know anything about the other sixty-five per cent. of the factors involved.

It is almost impossible for the student in the liberal arts curriculum to acquire the quantitative habit of thought. I don't need to say anything about what is required in your science and engineering with regard to this quantitative habit of thought. It is so ingrained in all of you that if you have to consider an economic problem, the first thing that you do is to try to evaluate the factors. You say, "This is an important factor and that is a negligible factor, and this other one is half as important as the first." You want figures, you want quantitative measurements, and you try to find them. You attack in that fashion any problem that comes to you, intuitively, by reason of the very habit of thinking which you acquired in your science and in your engineering courses.

Unfortunately for all of us and for this country of ours, too many of our economic problems are being attacked on the basis of emotion, of qualitative thinking. A factor appeals to the emotions of those in power, and is acted upon as though it were of fundamental importance, when actually that factor may be a third order differential which can have no particular effect upon a proper solution of the great question that is before us.

We have too much economic thinking of that kind. We need in our government, we need in our civilization today, which is a civilization based on science, the habit of quantitative thinking that is instilled daily in every man who studies science or engineering.

Those are the things which, it seems to me, are the important things in the way of cultural advantages in the study of science and engineering. I believe firmly that the quantitative habit of thinking necessary in science and engineering is a culture that is of vastly more importance to us of today's world than all the qualitative thinking, and all the qualitative ideas it is possible to acquire in any other line of instruction to which a student may be subjected. (Applause.)

PRESIDENT JACKSON: Dr. Hotchkiss, we thank you for thus laying before us this disclosure of your views.

I have already called your attention to the way in which we are progressing from bar to bar. You started with the dry sherry exhibited at the head table. I tried to give you a bit of light wine with a certain amount of seriousness in it. We have now had the burgundy; and you remember burgundy is a high order of wine.

Before we uncork the next bottle, which will be champagne,

I want to call your attention to the fact again, as you know, that the states have thought that it was necessary to recognize us as professional men, and forty-odd of them and a couple of territories have passed acts regarding registration of engineers who come notably in contact with the lives of our fellow citizens.

At this moment, without breaking the thread of thought, I want to call to your attention the fact that the Secretary of the National Council of State Boards of Engineering Examiners is here, from Columbia, South Carolina. Mr. Legaré, won't you kindly stand up? (Applause.)

And our member who is a Past President of that same Council is sitting right in front of Mr. Legaré — Professor Scott. (Applause.)

Now let us come back to our speakers' program. The second speaker, who will talk to us on "The Cultural Advantages of the Study of Latin," is a man of distinction whom I denominate as the champagne. He is a graduate of Haverford College, a well-known scholar in the field of Romance languages. He was a member of the faculty of Haverford College, and also later of Cornell University, and has been President of Haverford College since 1917. He is an author and also the recipient of many honors.

It is perhaps significant, maybe it is chance, that the first name of each of our speakers is William. The middle name of our next speaker is Wistar, which proves that he comes from Philadelphia. In fact, if I remember correctly, he was born in that very delightful suburb of Philadelphia called Germantown.

I now introduce to you personally the well-known scholar and President of Haverford College, William Wistar Comfort. (Applause.)

Dr. William Wistar Comfort: Mr. Chairman, Gentlemen: It is a very unusual thing for anybody in Philadelphia to be invited to come and speak in New York. And when a president of a small liberal arts college is asked to speak before a national institute of consulting engineers, it is indeed overwhelming. I lost confidence at first, but got it back. (Laughter.)

It came about in this way. I have a daughter also, beyond the fifth grade. She is a great admirer of her unworthy father, and when I told her what was before me, I said that I imagined you would be busy all day with meetings of your profession and that I was invited to come and speak at the dinner in the evening, and felt some qualms about it. She said, "Well, I guess by evening they'll be ready for something intellectual." (Laughter.)

I have also gained some confidence by many years of association with the Engineers' Club in Philadelphia, whither I go from time to time either to entertain them or to edify them with such material as I can provide from the outlying districts.

This subject which I am supposed to address myself to is a very old one. I am aware, from reading some of your periodicals and from attending discussions before, that it has been on hand a long time, this question of whether Latin is dying or whether it is dead. It reminded me very much of the position of the old man whose wife had been ill for years and confined to her bed; when a friend asked him how she was, he said, "Well, she's just about the same as usual. I wish she'd get well, or something." (Laughter.)

If I have to defend Latin very many more years, I shall be in the position of saying, "I wish that Latin would get well, or something."

My attention happened to be called somewhat to this subject which is engaging us for the moment because we have a Department of Applied Science, which we prefer to call it rather than engineering, and we had to have what we thought was a proper curriculum for the students who wished to devote themselves to applied science.

Fortunately, the head of our Department of Applied Science is a Stevens graduate who had very broad and generous ideas as to the amount of other material which might properly, in a college like Haverford, be included in the preparation for a bachelor's degree. A summary of our efforts and of our intentions is this: "The engineering courses are designed to give a thorough training in fundamental engineering principles, and as far as practicable to illustrate the application of these principles to their associated industries."

We have a modern laboratory, containing all the necessary requirements for a laboratory of applied science; a library; mechanical and electrical laboratories, classrooms, drawing rooms, and so on. And we are near enough to a large city to be able to indulge in frequent expeditions to observe certain manufacturing companies and industries.

Then we have this to say:

> The lack of a general or broad education and of thoroughness in fundamentals has been universally recognized as limiting the usefulness and opportunities of many in the engineer-

ing profession. To provide against these deficiencies, students electing courses in engineering will be required to pursue studies of a general nature, such as history, ethics, economics, languages, etc., throughout the four years, and to concentrate largely on mathematics, physics, and chemistry, the fundamentals of all engineering.

This combination of breadth, width, thorough groundwork, prepares the way for the highest professional development, but it only prepares the way. Haverford graduates who desire more specialized training before entering the active work of the profession are granted substantial credit toward advanced standing in technical institutions or are admitted to their graduate schools.

They are admitted generally to the junior year, in a few rare cases to the senior year, at such institutions as the Massachusetts Institute of Technology.

Perhaps you would be interested in knowing, in a little place like ours, the subjects which are regularly presented each year, in the form of, I believe, seventeen half courses, that is, term courses:

Shop methods
Principles of engineering
Drawing and shop methods
Surveying
Engineering orientation
Mechanism
Analytical mechanics
Descriptive geometry
Heat engineering
Materials of engineering
Strength of materials
Internal combustion engines
Fluid mechanics
Mechanical laboratory
Elements of applied electricity
Alternating current, theory and practice
Electrical magnetic and communication circuits
Electrical circuits and measurements

Finally, we have special projects in engineering which seniors are encouraged to take up of their own volition, tackle and carry through during the year.

Now, what is our program, as we visualize it in a liberal arts college, and how far does it go toward meeting the criticisms which have been made by your own men time and again through the last twenty-five years as to a too narrow curriculum? Of course, it is this narrowness which we, as an undergraduate college, have tried to avoid.

In the freshman year: English composition and literature; one foreign language; mathematics; inorganic chemistry; principles of engineering; drawing and shop methods; engineering orientation and surveying; physical education.

This is a suggested program, remember, for an engineering or an applied science major student.

Sophomore year: American government; elementary economics; calculus; general physics; mechanism; analytical mechanics; and physical education.

Junior year: Government and business; transportation; psychology or ethics; qualitative analysis; differential equations; elements of applied electricity; alternating current; one elective course for the whole year; and physical education.

Senior year: American literature; accounting; the corporation, industry and society; statistics; heat engines; strength of materials; mechanical laboratory; internal combustion engines; and one elective for the year.

Now, of course, you will say nobody could take all that, and nobody can take it. That, however, is a program which is suggested, and from that program at least six full courses in applied science or, if you will, in engineering can be taken. We have a total of twenty courses for a degree, four times five; and at least six, possibly eight, courses of the twenty can be taken quite specifically in the field of applied science.

But I am not oblivious of the fact that my subject is the cultural value of Latin. The defense of the classic languages as an integral part of the education in America has been, for the most part, in the hands of fervent classicists. The testimony of one who cannot claim this reason for their defense may perhaps have the greater weight because it comes from outside of the inner circle of classical devotees. Like thousands of my contemporaries, and I suppose perhaps the majority of men in this room, I studied Latin all through school and during a good part of my college course, and have had constant cause to be grateful for that much exposure to Latin, and to somewhat less acquaintance with Greek.

Without in any sense, then, being a classicist, I am one of the

large number in the last generation who spent a substantial amount of available time in the somewhat exacting disciplines of Latin and Greek before beginning what later became my own field of study, the literatures of southern and western Europe.

The word "defense" of Latin was used above, and it is in fact true that Latin has been on the defensive in this country for several decades. It seemed sometimes that it was actually on the run and in a fair way to follow Greek as an object of study which America had, on the whole, been unable or unwilling to appreciate. Yet, as a matter of fact, in 1923 and 1924, it was shown by the classical investigation published at Princeton by the American Classical League that there were actually at that time more students studying Latin in the public and private schools of the United States than were studying all other foreign languages combined. There were, in fact, nearly a million students studying Latin at that time. And I have no reason to think that the situation has been greatly changed in the last fifteen years. This was as compared with very substantially smaller numbers studying French, Spanish, German, and Greek, in the order named.

The tragic side of this otherwise impressive statement is that, of any one hundred pupils beginning the study of Latin, say, at the beginning of the high school, Latin is a one-year course for thirty-one pupils, a two-year course for another thirty-eight pupils, a three-year course for another seventeen pupils, and a four-year course for only fourteen pupils. In other words, only fourteen per cent. of those who begin the high school course of Latin continue its study until they graduate from high school; and only five of these fourteen may be expected to continue Latin in college. This represents, of course, a deplorable waste. If ninety-five per cent. stop before reaching the point where Latin may be studied with a degree of enjoyment and with cultural profit, it is too bad.

The reasons, of course, which dictate the dropping of Latin are several. One is that some students find Latin too difficult and in many schools now are encouraged to take something easy. Others do not like Latin, and are therefore encouraged to drop it, because you mustn't do anything that you don't like any more. Third, for others it took too much time, which is a more legitimate reason. Still others considered it of little or no value. And finally, there was the pressure of other subjects.

I have mentioned these figures without apology, for I know that many of your profession are somewhat familiar with and perhaps somewhat prone to the use of statistics; and also because I

am one of those who believe in more rather than in less Latin. But I am not so fatuous as to make any defense tonight of the study of Latin in an institution of higher learning which specializes in the teaching of applied science and engineering. I can readily conceive that there is very little, if any, possible time for the study of Latin or Greek in an engineering college.

With your permission, let us confine ourselves to the cultural advantages of the study of Latin for four years in the high school; and I say *four* years in the high school, whether private or public. If I can persuade you of the expediency of even this much attention to Latin, I shall feel amply repaid. And if any of you have got past the age of dictating what your children do in school, I hope you may have more luck with dictating what your grandchildren do in school. (Laughter.) They may possibly pay some attention to a really old man who isn't in the family circle.

Let us consider a few reasons for the study of Latin which have been frequently advanced, and which I shall not mention with any emphasis upon the order of presentation. Of course, I would like you to follow along in your own minds and see to what extent, in your own experience, these reasons have proven valid.

First: The increased ability to understand Latin words, phrases, and abbreviations which occur in English, and to understand and to speak with at least approximate correctness the fifty-two per cent. of English words derived from Latin in our current vocabulary. Much of this would be true also of Greek, but we are not considering Greek this evening.

Next, one might well emphasize the importance of Latin, as President Hotchkiss has done, from a slightly different angle, as the medium of a European civilization which lasted fifteen hundred years. That is as long as all the important history of French, German, Spanish, and Italian literatures combined, since the Renaissance to the present day: fifteen hundred years during which all that was highest and best in human thought and experience, with the exception of Dante's *Divine Comedy*, was expressed in such Latin as the Church was able to command.

And the reason we call that period and the people who are devoted to that long period, sometimes, Humanists, is because that literature dealt chiefly with men. If there is anything that is lacking today, gentlemen, it is not in your department, which is magnificently staffed for dealing with things and with physical forces; but what this world, what the United States needs today are men

who are trained in a knowledge of mankind and in the motives and forces according to which men work. (Applause.)

For the historian, the philosopher, the student of literature and of ideas during this immensely important formative period of European civilization, Latin is a necessary tool. Furthermore, as you know, it is the basis of four important languages, called Romance because of their derivation from it: French, Spanish, Italian, and Portuguese; and of four other minor languages from the standpoint of literature or use, and those are Provençal, Catalan, Roumanian, and Rhæto-Roumanian. It is evident that for a student of any of these languages the knowledge of Latin sets him off to a good start. Latin is the mother tongue, and these others are the daughters of Latin. In fact, it is true to say of Italian or Spanish or French that it is twentieth century Latin.

Indeed, one may say, further, that the study of Latin grammar, syntax, and etymology in comparatively early years makes the subsequent study of any language easier, because of the linguistic training secured early in life. I wonder if you gentlemen know that in the schools today there is almost no time spent upon the analysis of the English sentence, upon a study of English syntax, and still less on that famous old study, etymology. The consequence is, gentlemen, that it is extremely difficult to deal in our courses in English with students who come up to college, at the age of seventeen or eighteen, who have been trained in English only as it is taught, and who have not been trained in English through a study of Latin grammar.

It is, of course, a pity that more of those who start and who reap some benefit from the early stages of the study of Latin, do not continue to enjoy such literary authors as Vergil, Horace, Ovid, Catullus, Seneca, Pliny, and the dramatists; and these students cut themselves off from a very real enjoyment, as well as profit. For the effect of Latin, as will be presently shown, is cumulative, and to study it for four years is four times as profitable as to study it for only two years.

Well, besides the two reasons which have been suggested above, the belief is very strong among educators that Latin does something for the student which might not be expected and which is not done by other studies. Latin has the great advantage of being a dead language. Now, I've been teaching living languages for forty years, and I know something about the difficulties of teaching French or German or Spanish or Italian. They are all alive and they are all quivering, they are all changing; they object to people

dissecting them. The moment you get something fixed, one student pops up and says, "But couldn't you say this another way?"

"Well, yes, you could if you felt that way about it."

And then the whole demand for certainty in the American youth is ripped open, and he says, "What do you think of a language like that? There isn't just one way of saying a thing. You can say it in many ways."

He doesn't see that that makes it rich. He simply sees that that makes it troublesome.

Now, Latin has the great advantage of being a cadaver. It stays still. It doesn't mind how much you operate on it. You can cut it, you can tear it open, you can study all the features of Latin syntax, that marvelous principle upon which a thought is built up to a climax in a sentence. That is a great advantage to the student of any language, including English, which all of us have to use in our profession.

Besides the technical appreciation of delicate shades of meaning in speech gained from the close study of a dead language, I refer to the disciplinary value of Latin—a word which I shouldn't dare to use before progressive educators; but I know you will stand for a little discipline—in the development of certain desirable habits and ideals which are subject to spread, that is, not confined to Latin, such as habits of attention, orderly procedure, overcoming obstacles, perseverance, ideals of achievement, accuracy and thoroughness in the use of language, and the cultivation of certain attitudes such as dissatisfaction with failure or with partial success.

In the classical investigation already referred to, the judgment of ninety-three per cent. of the teachers asked was that this disciplinary objective just quoted was a legitimate objective to seek in the study of Latin. Furthermore, fifty-six per cent. of the teachers interrogated stated that satisfactory results in this direction were noticeable in their respective schools.

Now, this is interesting if true, and I think you will agree that it concerns your profession as much as any other. You are interested in students who have ideals of achievement, who overcome obstacles, who are dissatisfied with failure or with partial success.

These are traits which are often claimed as their special prerogative by the apostles of athletic training. Some of these apostles are too vociferous; but we all believe in the value of athletic contests. What red-blooded boy or girl does not covet these traits just mentioned? Is it possible that Latin does something to a boy

akin to his gruelling experience on the football field, not in the *esprit de corps* developed, but in the determination to overcome resistance which is offered by that page, that sentence, that verse of Cicero or Vergil or Ovid?

Yes, because both football and Latin require intelligent application, conscientious practice, and the determination to overcome an adversary, in one case arrayed in flesh and blood and nowadays in an increasing panoply of armor; in the other case arrayed in the form of a mental obstacle. The Latin student wrestles, not with flesh and blood, but with principalities and powers, and of course he comes out of the struggle stronger than he went in.

I believe in Latin for just the same reason that I believe in mathematics. Latin was easy for me. Mathematics was very hard. But I got the training, I think, out of the mathematics quite as much as out of the Latin. And you mustn't think for a moment that in my mental picture Latin is the only thing that I think is worth studying in school—I'll tell you about that just in closing—but it is one thing that I think has enormous cumulative advantage in the development of gray-matter.

I have been teaching modern languages, as I say, for forty years, and can testify from my own experience that it is almost always possible to distinguish in a class those who have been thoroughly prepared in Latin by their diligence, their thoroughness of preparation, and their understanding of linguistic phenomena, even when these traits are applied to the study of other languages and literatures than Latin. There is no greater annoyance for the teacher of modern languages than the number of students in French and German who are satisfied, entirely satisfied, with a beginning of an intelligence of the meaning of a sentence, with a barest approximation of what the sentence really says in its entirety.

You don't get that in Latin. A boy may throw up his hands in Latin and say, "I can't make out what this sentence means," but he is not satisfied and he doesn't bring in to his teacher a perfectly mangled performance, which is what we get in French and in German all the time, with the student saying that he is prepared. Well now, in Latin, I think you will agree that we were somewhat ashamed if we didn't have the translation, unless we made an honest effort to box that sentence completely and to be able to parse, if necessary, every word in it. Now, that is what I mean by the difference in thoroughness. And it has carry-over value from Latin to other languages.

But I can do better than give you my own unqualified testi-

mony. Once more may I refer to statistics which we have kept at Haverford College for eighteen years? There are given at Haverford every year four corporation scholarships of three hundred dollars each in each of the four classes, thus making sixteen awards a year. The scholarships are strictly competitive and do not have to be applied for; they are given as honor scholarships. For each year they are awarded to the four highest standing students of the preceding year, the freshman scholarships being awarded to the four highest standing students in the required College Board entrance examinations. We thus have each year sixteen students in college who are the scholastic leaders of the student body, so far as marks mean anything. They may be studying anything from applied science to philosophy.

Our inquiry has been to discover what correlation there was between the study of Latin in high school and their ability to secure our leading scholarships in college, regardless of what courses they might at the time be taking. The results are as follows: Out of two hundred and ninety-two such scholarships which have been awarded in eighteen years, one hundred and ninety-four, or sixty-six per cent., went to men who had studied Latin for four years in high school. Thirty-six went to those who had studied three years. Forty went to those who had studied Latin for two years, a very large group, and twenty-two to those who had studied no Latin.

In comment upon these figures one should say that a very decided majority of our applicants have studied Latin in high school for only two years. Not more than one-third of our entering freshmen have had Latin for four years. The superiority, therefore, of those who have studied four years is very much greater than at first would be indicated by these figures.

However one may look at them, it is evident that a student who has studied Latin for four years in school has a decided intellectual advantage coming to him in any kind of work which he may take up later in such a college as ours. I believe this is also true of four years' study of mathematics and four years' study of English. But the reason that our consideration of Latin is important is that the truth about Latin is not generally known and is frequently contested. No one questions the necessity of studying English or mathematics for four years, but many do not know that it is just as much of an advantage to study Latin for four years as it is these other two subjects, which form the basis of all study in our secondary schools.

Perhaps, then, you will indulge me if I would suggest the following curriculum as ideal for everybody, because it places foundation studies where they belong and furnishes a solid rock upon which subsequent science and engineering studies can be based in college and the university.

I am talking now about an ideal high school program from my standpoint. We assume that the pupil has available time for four courses a year, for four years. That is a minimum. The program I suggest is English for four years, Latin for four years, mathematics for four years. That takes up twelve of the sixteen courses. What shall we do with the other four? A modern language for two years, history for one year, and a laboratory science for one year.

Now, where that program is short it can be made up for in college very quickly. Where it is long, namely, in Latin and in mathematics and in English, you have had in four years, in a good school, a pretty consistent and exacting course in three elementary foundation subjects.

Our experience is that the best prepared boys have had a program which closely resembles the one just mentioned. It offers a chance for the formation and detection of certain tastes and capacities in the individual; but it also gives him primarily what at least a preparatory school is supposed to give, a preparatory foundation upon which any superstructure can be built in college or in professional school.

You know probably that the classic remarks on Latin are those of Anatole France, written in 1880, in his beautiful little essay, *"Pour le Latin."* I will not go back to Anatole France, but only to 1923, when the French Minister of Public Instruction wrote: "Expereince and not theory is what counts in this case. It is experience that shows the defects in a plan of studies." They had been flirting with dropping Latin in France out of some of the government scientific schools. He continued, "Those disciplines which it has tested and approved are the surest, even though they be the oldest."

And I need not remind you that all of the civilizations of Europe—whether you approve of them at the present moment or not need not concern us—all the empire builders have been trained in the old university program, whether in England or France or Germany or Italy or Spain; Latin has been, all through the centuries, one of the foundation subjects. Are we an exception in this country or not? In spite of all the panaceas which have been

offered by so-called progressive educators, we must bear in mind that Latin has stood a pretty good test as a major objective of youthful development for now two thousand years, from the time of Julius Cæsar to the present.

A confession of faith on my part may be expected and permitted when I say in closing that if a young lad of thirteen or fourteen asked me what he should do, not to be saved, but in order to have the best chance of turning into a wise and capable man, I should advise him to study all the Latin and mathematics within reach, and to go to church on Sunday. (Applause.)

President Jackson: Dr. Comfort, we certainly appreciate your having come here and given us this article of faith. You have truly touched a rather sympathetic chord. That is substantiated by the applause.

But there is one thing I would love to hear you expound; and that is the probably more rapid and effective development of civilization which might have been expected had the Romans, as they withdrew from the north and west of Europe, left behind them their language as a universal language, instead of only leaving behind the skeleton of language in the form of their alphabet.

Dr. Comfort: Just what feature of that interesting comment would you like me to deal with, Dr. Jackson? The evening is late.

President Jackson: I wouldn't ask you to do it now, but hope that you will think it over. I wonder if we might not get you some of these days to give us an exposition of that proposition. That is an interesting and broad and philosophical proposition.

Dr. Comfort: May I say this: I think they would have been perfectly willing to stay if they hadn't been driven out.

President Jackson: Yes, but they left their alphabet and failed to leave their language when they were driven out. Now, how much better off would we have been if there had been a universal language, the right one of that day? And, of course, the right one of that day would have been the Roman language.

Gentlemen, the champagne followed very delightfully after the burgundy. We now have fifteen to twenty minutes, depending upon how excited you become, for the liquer. Who wants to start?

Mr. Gavin Hadden: Mr. President and Gentlemen: I think it is rather astonishing—I don't know whether the others noticed it or not—that in the two very distinguished speeches we heard this

evening not a single word of Latin has been spoken. Dr. Hotchkiss of course refrained from quoting Latin, but I am surprised at the self-restraint of Dr. Comfort in not putting some Latin into his speech. I will try in a very small way to remedy that situation.

When I was a young boy studying Latin at school I heard my father at home one day quote some famous words of Latin: *"Vē-nī, vī-dī, vī-cī."*

I immediately contradicted him, rather impolitely probably—even in those days the young boys sometimes were impolite to their parents—and I said, "Oh, no, father, that isn't right. I've been taught that it should be *'wa-nē, wē-dē, wē-kē.'* "

My father turned to me and said, "Son, when I was a boy, the ancient Romans pronounced their language differently from the way they now formerly did." (Laughter.) That perhaps indicates that the culture of one generation is a little different from the culture of another. But please don't think that I am one of those who believe that the study of Latin is old-fashioned. I'm sure Dr. Hotchkiss is not one; he can't be; he definitely denied it. You might almost say the same thing of the study of the Bible if you say that.

But I think that the form of this meeting is a little deceptive. It hasn't been a debate at all. These gentlemen agree, and I agree with them, that both of their subjects are useful avenues of culture. I am for both of them.

As Latin has been a part of the theme of the evening—we might call Latin the trylon and engineering the perisphere—it might be proper to say for everybody here present: *"Hæc olim meminisse juvabit."*

Dr. Harry S. Rogers: Gentlemen, I am sure this is not going to be a Quaker meeting, by the response we have already had.

President Jackson: You must bear in mind that the Hicksites and the orthodox Quakers always scrap.

Dr. Rogers: I do not care this evening to speak upon the points of difference between the two speakers; I would rather resolve the force of their arguments toward this field of culture. When we approach the subject of culture, we are too apt to do so with an emotional manner of thought, and that leads to impulsive, opportunistic, and circuitous thinking. We find this culture nebulous, elusive, and intangible. We feel perhaps that it is glorified and sacrosanct. Those who seek it in the manner alone, without

the substance, most frequently miss it entirely; and those who attain it frequently do so without any design. But if we approach it critically it seems to me that we find culture to be nothing more than a breadth of interest, a cultivation of talents, and an attitude of spirit.

Now, in this day of such intense specialization as we find in the dead languages or the modern languages or in science, it is not possible for anyone to become cultured by attaining the heights in all fields; but it is important for one who hopes to become cultured to attain the heights in one field and to develop an amateur interest and amateur ability in other fields. His culture then may become characterized by a grace of manner, by an art of expression, by a sense of values, and by a virility and catholicity of thought.

We think too often of culture as dealing with the arts, with the drama, with philosophy and literature alone. But those who seek it through the arts and the humanities alone and acknowledge its development and attainment, are very apt to become snobs, and those who, on the other hand, are contemptuous toward it and concentrate upon science and constructive thought alone, are very apt to become bores. It is only those who unite the fields of study and thought in the arts and humanities, in science and technology, who become cultured gentlemen, even though they be engineers. (Applause.)

Prof. Hardy Cross: A classical scholar who comes here to talk about the advantages of Latin for a group of consulting engineers has a great deal of courage, not because we will disagree, but because he probably thinks we will do so. I said a few years ago to a cousin of mine who is a classical scholar that I thought I had learned as much engineering out of Latin grammar as I ever learned out of an engineering text. When he began to quote the statement in print, I said, "Please be a little careful; don't let my colleagues hear this, and certainly don't let the authors of the engineering books hear about it."

I remember little Latin—only a phrase here and there. But in *Gildersleeve's Latin Grammar,* an ablative absolute was an ablative absolute, and not an ablative of cause or some vague ill-defined ablative. I learned there classification and accurate definition.

We are talking here tonight not about engineering, but about education, about teaching men not what to think, as so many misguided people suppose, but how to think, how to classify, how to arrange.

I agree heartily as to the cultural and educational value of Latin; but engineering is Latin plus much other training, and don't forget the plus. Engineering requires a certain constructive attitude of mind, and this is more important than a lot of little fragments of information. In this it corresponds somewhat to Dr. Whitehead's definition of culture. The engineer thinks out his problems a certain way; men trained only in the more traditional fields often try to imitate that way of thinking, but miss the discriminating attitude toward data and the constructive urge in conclusions.

As regards the specific information that I still have from a Latin grammar, I remember only *"Qui modeste paret videtur qui aliquando imperet dignus esse."* That means roughly: A good apprentice may become a mighty good foreman. That is good engineering doctrine anywhere. (Applause.)

Mr. C. E. Davies: The remarks of the last speaker encourage me to take issue with the notice of this meeting which carries the general assumption that engineers lack cultural background. I do not agree with that assumption.

We must face the fact that a portion of our profession lacks real facility in spoken and written English, but on the other hand there is a larger portion who are not only able to write and speak convincingly, but who are active participants in the arts. Among my own immediate engineer acquaintances are two excellent painters, a half-dozen fine musicians, two who have remarkable collections of fine books and a large number who are regular patrons of the opera and symphony orchestras. These are in addition to the hundreds of engineers throughout the nation who, in addition to their daily work as engineers, are taking positions of leadership in the civic and humanitarian activities of their communities.

Mr. George W. Burpee: Mr. Chairman, may I second the words that Mr. Davies has spoken? I doubt that any profession in the world is any better versed in Greek than the engineering profession. What other profession knows the functions of the angles Alpha, Beta, Gamma, Phi, and the symbol Epsilon?

I remember that in my early engineering days at M. I. T., where Dr. Jackson was then presiding over the Department of Electrical Engineering, we were told that the theory of elasticity was all Greek to us, both literally and figuratively. Now, may I, in vulgar language, say to the President: I stump you to call for

a show of hands of this august assembly as to who recognizes the quotations: "Μῆνιν ἀεἰδε θέα" and "'Εντεῦθεν ἐχελαῦνει" and *"arma virumque cano"* and *"Gallia est omnis divisa in partes tres."* I'll venture to guess the response will be surprising.

I submit, therefore, that in addition to proficiency in engineering, a culture of a high order in itself, engineers are making a real contribution to the cultural growth of our nation.

Dr. A. C. Purdy: As a chemist who struggled through Cicero with difficulty, I have been greatly impressed by the fluent and apparently correct, or at least unchallenged, quotation of the Latin classics by the engineers who have already commented. It may, however, be of interest to cite a case in which an incorrect Latin quotation proved useful to a chemical engineer.

A few years ago an associate of ours had occasion to criticize the conclusions reached by the author of a technical paper and in the presentation of his criticism he made use of a devastating verbal weapon—the word *'mumpsimus.'* Curiosity having driven many of us to our dictionaries, we found that this word has an interesting derivation. It seems that long ago there was an ignorant monk who for many years had said *'mumpsimus'* in saying Mass, instead of *'sumpsimus.'* When his error was finally called to his attention, he is supposed to have replied, that he had always said *'mumpsimus'* and intended to continue to say *'mumpsimus.'* The word has, therefore, entered the language defined as "a tradition or custom obstinately adhered to"—a very useful word to engineers who all too often encounter a mumpsimus in their pathway to technical progress.

Mr. Irving V. A. Huie: Mr. President, we have heard three or four definitions of culture, and to me they are all identical; at least, they convey the same things to me, even though they are in different words.

Dr. Hotchkiss indicated that through the engineering course we might acquire culture. President Comfort indicated that through Latin primarily and other courses we might acquire culture. I agree with both.

I want to digress for a second to congratulate you on your keen foresight in choosing the sequence of your speakers, because Dr. Hotchkiss indicated that the teacher had a lot to do with imparting culture regardless of the subject, and I think the fact that President Comfort laid emphasis upon the fundamental education prior to college indicates the sequence and the direction in which

we should look for the foundation of this culture. As Dr. Hotchkiss pointed out, we are going to—I think he called it "loose methods of preparatory education," or something possibly not quite as drastic—the mere fact that we are going to those loose methods is bringing into our colleges, whether they are scientific or whether they are academic, a poorer product to work with. We do not have the material that we had years ago.

If Dr. Comfort had not already done so, an inquiry into the preparatory courses of the hundred ninety-two men who received the scholarships probably would indicate that Latin was mandatory in those prep schools and not a selective or optional course. I believe that our primary and prep school education is falling down on our colleges, and that fundamentally we have to go to the basic education to make the necessary corrections.

PRESIDENT JACKSON: Let me set this straight. Mr. Huie is right about the advantages of our sequence, but I regret to say that I can't claim the credit; it belongs to our very admirable Secretary, who set up the sequence.

Gentlemen, if my watch is right, we still have five minutes before we adjourn at eleven o'clock. I wonder if we hadn't better take that period for the two minutes for each of our speakers for rebuttal, if they have anything to say, and I expect they have.

Would you like to start? (Indicating Dr. Comfort.)

DR. COMFORT: No, I'm satisfied with the original batting order.

PRESIDENT JACKSON: President Hotchkiss, the floor again is yours.

DR. HOTCHKISS: I don't know whether it is modesty or policy or strategy upon the part of President Comfort that leads him to insist that I speak first. It has been pleasing to me, gentlemen, that there has been so much of agreement in the ideas expressed by both of us.

I think Mr. Davies brought out one point here which comes from the fact that the question of the culture of engineers is raised. If I were to say to you people here that three of the prominent qualities, amongst many, needed for a good citizen were broad-mindedness and generosity and public spirit, you would all agree with me. And yet, if I were to ask each of you to hold up your hands who thought you were broad-minded and public spirited and generous, you would hesitate when it is suggested that we engineers

lack culture, we are inclined to be hesitant about rising to assert that we have.

The culture of the engineer has been impugned by many of our own fraternity. There was a bill introduced in the Legislature last year up at Albany. A good friend of mine, a lawyer in Albany, called me up on another matter and then he said, "Say, what about this idea that engineers lack culture and that the Legislature has been asked to require that they get some. In my practice I have had to deal with engineers all my life, and I don't think there is any difference between the culture that I see in my engineering acquaintances and the culture that I see in my acquaintances of other persuasions."

I think that the very fact that the cultural value of our engineering courses is questioned causes us all to become too modest. It was that that started me to thinking on this subject.

I may say to Mr. Burpee—is Mr. Burpee gone?

MR. BURPEE: Right here.

DR. HOTCHKISS: (Continuing)—in connection with his explanation of the knowledge of the functions of the Greek alphabet which he raised, that one of my science professors once added to the Greek alphabet. He put formulas on the board for us until he ran out of the alphabet, then, being an Easterner, he said, "we will represent this by *Pi* in yaller chalk."

I think that is more than the classicists could do. (Applause.)

PRESIDENT JACKSON: President Comfort, you have the floor.

DR. COMFORT: We are more than ever sure today that education is caught from individual to individual in the formative years. Many of you gentlemen here tonight have been thinking of the engineering school, the technical institution, where the boy knows what he wants and presumably is ready to work for it in order to compete on fair terms with his fellows in that profession. I deal with boys at a somewhat younger age level. I teach freshmen, and have for twenty-three years, at nine-thirty every morning; and I have some knowledge of what equipment they bring with them from the average school and from good schools.

Those boys very seldom know what they want, they very seldom know what they are going to do, except those who are looking forward to medicine. That is a taste which declares itself earlier than any other that I know of. Our problem and the whole prob-

lem, I submit, of education anywhere below the level that President Hotchkiss represents, is simply to wake up one boy at a time.

You can lecture to classes and think you are giving a fine lecture. It goes right in one ear and out the other. You can throw things on the screen, and they go in one eye and out the other. However, much light there may be in the room, if it does not reach inside of the individual everyone is only fooling himself. And I have come to the conclusion that the whole problem of the few hundred boys that I deal with, young men between seventeen and twenty-two, is that each one of those fellows, by the personal contacts which are furnished for him in a college, through the older brothers that are farther along on the path, whether it be in engineering, philosophy, or Latin—each one of those fellows has got to be kindled and have his own little candle lighted. Nobody has ever lighted it yet. Somebody in some class has got to light that candle for that boy. And that is the whole business of education. (Applause.)

President Jackson: Gentlemen, let me again express to our two speakers our appreciation. Of course, we had a string on Dr. Hotchkiss, because he is one of our members; and, moreover, our Secretary is Vice-President of the institution which he leads. But we appreciate very much his presentation which has put us in his debt. And of our guest speaker, Dr. Comfort, I assure him that it has given us great delight to get his views. Moreover, it has given us all pleasure to find that we are sympathetic toward those views.

Mr. Needles: Mr. President, may I just inject one thought?

President Jackson: Mr. Needles.

Mr. Needles: If this has been a debate—and I am not sure we should agree it has been a debate—but if it has been a debate, can't we agree that Dr. Comfort has won, because of the fact that every engineer who has arisen to demonstrate his culture has resorted to Latin? (Applause.)

Mr. Burpee: But he needs to recite the Greek alphabet.

President Jackson: Gentlemen, Mr. Needles has made a point.

Now, let me remind you, those of you who are members of the Council of old or just elected, that there is a meeting tomorrow at twelve-thirty at the Engineers Club.

Now, again expressing great appreciation to our speakers, I declare this meeting adjourned.

. . . The meeting adjourned at eleven o'clock.

Admiral R. E. Bakenhus: (By letter)—It has been a privilege to hear the two addresses—one by President Hotchkiss of Rensselaer and the other by President Comfort of Haverford College, the two presumably representing opposite or at least divergent schools of thought in regard to education. After hearing the two addresses, we find them not so far apart after all, for the objects of education in Latin as outlined by President Comfort and its effects in training the mind of the student is not so far different from the object as drawn from the outline of an engineering education by President Hotchkiss. Then, too, there is the problem of the educator not knowing the career for which the student is preparing, and in this field the engineering school has some advantage —perhaps its greatest advantage over the general liberal arts school. Of course, President Comfort, in accordance with the invitation extended to him, has covered principally education in Latin, and has informed us as well of the opportunties to study applied science and mathematics in preparation for engineering. Between the study of this magnificent dead language and the study of applied sciences and engineering, there is a vast field of subjects, the educational value of which is at least open to much question. This field has not been covered during the discussions of the evening.

In fact, the impression made on my mind is that a brotherhood exists as between the Latin education and the engineering education. An old phrase from my years of Latin study comes to mind in this connection, which may possibly illustrate the point I wish to make. The phrase is somewhat obscure and even a Latin scholar cannot always get its meaning clear. It is: "*Fortibus es in aro.*" On study, this obscure Latin phrase indicates that even in the ancient days the old Romans had some concept of what a traffic problem might be, possibly derived from processions of chariots or other vehicles. It was not until I stood on Fifth Avenue recently during a heavy traffic jam, that the meaning of this phrase became clear to me. It is only necessary to divide the syllables in a slightly different way and we have the meaning: (*forti buses in a ro*) "Forty buses in a row."

In all seriousness, the events of the evening and the two addresses have done more than their bit to bring about a clearer appreciation of what a thorough education can do for a man,

whether it be in Latin or in engineering, provided only that it gives discipline to the mind, a capacity for hard work, breadth of vision, loyalty to ideals, and, most important to all, lights that spark in a man, to which President Comfort referred, to bring out the best that is in him.

Mr. Frederick M. Feiker: (By letter)—It seems to me that the elements of the problem of engineering education are very simple, but the methods of arriving at a satisfactory solution are difficult. Engineering educators seem to be at crossroads in trying to determine one basic question—how to balance a four-year engineering educational program by evaluating what may be called the vocational content of the curricula with the curricula content. In the nearly thirty-five years since I was graduated from the Worcester Polytechnic Institute I have seen some elements of the vocational content of engineering schools sharply reduced. Shopwork, for example, no longer takes the time, nor is looked upon as so essential an element in the training of young men for the engineering profession as it was twenty-five years or thirty-five years ago. On the other hand, the specializations of industry have led to the addition of specific subjects to engineering curricula in the development of such new fields as aeronautics, air conditioning, radio communications, etc., in such a way as to load the curricula with teaching hours which dilute the teaching of fundamentals of mathematics, physics, chemistry and mechanics and electrical theory.

We have too many adjectives in front of the word "engineer" and we have to decide, as engineering educators, whether to accept the pressures of industry, who wrongly—as I see it—ask for men named aeronautical, heating and ventilating and "what have you" engineers rather than accept young men with a fundametal engineering training and expect them to get their specialization in the field to which they go. Meanwhile, those who agree to this philosophy would add to the fundamentals in specialized training in specific vocations, such as better training in English, economics and management policy.

One of the bad results of the development of registration laws and licensing is that it is forcing so-called institutes, where young men receive highly valuable and worth-while engineering training with a vocational basis from which they graduate in three years, to add a fourth year to their courses so as to accredit their men under license laws. This, I think, is a great mistake, as I believe there is a place for three-year training to turn out young men for

sub-professional positions, who either through force of circumstances, or by ability, should find it necessary to spend more time than this, and who may later develop into quite as able professional engineers through experience and service as those who have not only four years' training, but also the contemplated five or six years, which is being talked about.

Dr. Wickenden, I thought, put another phase of this question succinctly, when he said that we are training men for an engineering fraternity of which a section are professional, and that we must not lose sight of the needs of industry for young men who may or may not later become engineers in the professional sense.

Mr. Gavin Hadden: (By letter)—Perhaps I am taking an unfair advantage of Mr. Henry's kind invitation in presenting some additional views on the subject of the exceptionally interesting addresses of Presidents Hotchkiss and Comfort at the January 15th dinner meeting of the Institute. "The lateness of the hour," to quote from Mr. Henry's letter, did not in any way prevent me from presenting these views at the meeting; indeed, it would have been necessary for the meeting to last nine days for me to have been able to do so, as the remarks which follow are evoked largely by two documents which reached my desk only on January 18 and January 24, respectively:

"Pre-Engineering College Education," by Dr. D. B. Steinman, presented at the Annual Meeting of the Association of Colleges and Universities of the State of New York, October 6, 1939; and, "Report of the President of Harvard University to the Board of Overseers, 1938-1939."

Parts of each of these documents seem to have an interesting connection with the Institute's discussion of the respective cultural advantages of the study of Latin and the study of engineering.

There was such close agreement between the two distinguished speakers who addressed our meeting, each with the views of the other (and I did point this out at the meeting!) as to lead to the inescapable conclusion that the study of both subjects must inevitably have greater cultural value than the study of either one of them alone. This naturally leads to the broader concept that the study of liberal arts in general, plus the study of engineering, must likewise have greater cultural value than the study of either one alone. This broader concept is a principal subject of Dr. Steinman's paper and is referred to somewhat less directly in President Conant's report.

Dr. Steinman says, in part: "I am not here discussing the relative values of liberal college education and engineering education. I submit, however, that *a combination of the two is superior to either alone as a preparation for professional lifework.*" (The italics are his.)

President Conant's position is somewhat different: he has no need to advocate the study of liberal arts before the study of a profession as this prerequisite is already in effect at the Harvard professional schools. He says, however, in part: "Personally I am much impressed by the need for providing a broader education for all our professional men. . . . It seems to me those most concerned with liberalizing our higher education today should regard the college and the professional-school years as one unit. By so doing they may be able to evolve a consistent liberal pattern for the entire six, seven or eight years (depending on the professional school). Only thus, I believe, can we effectively broaden and improve the education of our professional graduates."

Dr. Steinman is struggling valiantly for the small loaf which there is some chance of obtaining as a starter for engineering education generally: not to "require" but to "encourage," as he puts it, just "two years of pre-engineering college study." (President Comfort was similarly conservative in advocating only a small loaf of Latin.) President Conant, on the other hand, is already a step ahead and is planning still further improvement of the combined arts and professional courses which he already has.

Mr. Philip W. Henry: (By letter)—Inasmuch as the word culture does not mean the same thing to everyone, perhaps it would be well to define both culture and engineering. According to Webster, culture is "the act of, or any means employed for, training, disciplining or refining the moral and intellectual nature of man." Engineering, by the same authority, is "the art and science by which the mechanical properties of matter are made useful to man in structures and machines." Never having studied Latin or Greek, I am in no position to discuss their cultural advantages, but having studied engineering four years at the Rensselaer Polytechnic Institute, and having practiced it for fifty years, I shall endeavor to set forth its cultural advantages.

In order that the "properties of matter may be made useful to man," it is necessary to know something about these properties; and that involves a study of pure science which is the fundamental basis of all engineering education. In order to study science one

must have a knowledge of mathematics; and he soon learns that he can depend on certain mathematical laws; that two and two are always four, no matter how much more convenient it would be if, in an emergency, they would be more or less, according to one's desire at the moment. By understanding these immutable laws, the movements of the heavenly bodies are made known, and the time and path of eclipses are foretold. By diligent investigation the properties of materials of all kinds are established, and the engineer can determine with surety that a given material will act always in a certain way under the same conditions.

Not only would the engineer have to know the laws of science, but he must also know all about their application in the past. This would necessitate a study of the history of such application. In order to design a power plant he would not have to make personally the experiments of Faraday which led to the application of electricity to motors. But he would at once, in designing a power plant or any other structure, take advantage of the accomplishments of others, which he should understand before attempting the solution of his own problem.

Thus, in applying the laws of science to structures, and machines, the engineer becomes acquainted with the fundamental laws that underlie the problem on which he is engaged. Does it not seem reasonable to conclude that, in studying other questions—political, religious or social—the engineer would first try to find out what laws underlie these questions? Would he not base his theory of government and economics on a knowledge of the characteristics of human nature, which he would have to study even as he had studied the characteristics of the materials that would enter into his design of engineering structures? Too many theories of government, including those of Plato and Marx, are based—not on human nature as it is—but on human nature, as, in their opinion, it should be. To this faulty conception of human nature are due the failures of communism, whether practiced on a small scale as in Brook Farm, or on a large scale as in Soviet Russia.

In order to understand human nature and its effects on the progress of mankind, the engineer would naturally study history in order to formulate his theory of government and economics, instead of accepting the reasoning of philosophers and doctrinaires, no matter how eminent intellectually they may be. Such a study of history would show that in the past governments and people have faced problems similar to those that face the world today; and these problems have been solved—sometimes successfully,

sometimes unsuccessfully. It would, therefore, seem that the successful solutions of the past should be applied to similar problems of the present.

Not only does the study of engineering aid in "training, disciplining or refining the moral and intellectual nature" of the individual, but through the application of the laws of science to "the mechanical properties of matter" the engineer makes possible to many others that leisure which is so necessary for the development of one's "moral and intellectual nature." It was the leisure afforded by the working of slaves that permitted the Greek and Roman writers and artists to bring about that culture which is so revered today. But they were a favored few. Through the mechanical slaves furnished by the engineer, many thousands now have the time and opportunity to become acquainted with the works of the masters of the past, whether in art, literature or music.

But is it necessary to spend two years in a liberal arts college before studying engineering, as is advocated by some eminent engineers in order to become cultured, as it were? Such a course would add two years to the age of the student before he could begin his career in life, and this would be a distinct handicap. If cultural courses are really necessary for the engineer—which I doubt, they can be pursued at home, at night school or correspondence school after graduation during the engineer's spare time, assuming that he feels a greater knowledge of music, art or literature would add to his professional advancement or to the durable satisfactions of life. If I may be permitted to allude to a personal matter: at the age of forty-nine I found that a knowledge of Spanish would be useful in my work, and I therefore undertook its study, chiefly at home with grammar, dictionary and phonograph. Owing to changed conditions, I never had the opportunity to use Spanish in a business way, but I became so interested in the subject that for my own satisfaction I translated several of the plays of Calderón de la Barca, a noted Spanish dramatist of the 17th Century. And to my great pleasure and satisfaction I witnessed last March selected scenes from one of these plays put on the stage by the R. P. I. Players, using my translation. So as a matter of fact, one can carry on cultural courses at any age during his spare time if he is really interested in "training, disciplining or refining his moral and intellectual nature."

And is there any other study than that of science and engineering that will better train one's moral nature? If the engineer learns that laws govern in the natural world, it is not hard to believe that

they also govern in the spiritual world. But spiritual laws are more difficult to discover and to apply than are natural laws. Perhaps this is because the emotional element enters in, as it does in all human relations. It is only a few centuries since man began to know something about the laws of nature. Perhaps in a few centuries hence he will know as much about the laws of the spirit.

In closing I desire to emphasize the cultural advantages of a study of engineering, first, because it means an understanding of the laws of nature by means of experiment and research. Then follows the application of these laws through a knowledge of what others have done. Such an education trains one to face other problems of life or government by first learning the laws pertaining to that subject, and then learning how these laws have been applied in the past. With this joint knowledge the engineer is equipped to undertake the solution of any problem placed before him, whatever its nature.

Prof. Charles F. Scott: (By letter)—In a paper presented to the American Society of Civil Engineers at its current convention Daniel W. Mead deals with the general subject of engineering ethics. In his introductory pages, directed particularly to engineering students, he lists a number of the qualifications of an engineer, assigning to them the percentage importance resulting from a questionnaire presented to several thousand engineers. He finds that such qualities as integrity, judgment, ability to get along with others and the like, tallies seventy-five per cent., while technical knowledge and skill in applying it total twenty-five per cent. Now the latter twenty-five per cent. is what is contained in the curriculum and what the professors aim to develop. The other seventy-five per cent. are personal qualities which depend for their development upon the individual himself. It is essential that the student understands that a large factor in engineering success is not included in the classroom grades that he receives.

It seems to me that the foregoing comparison is significant when we consider culture as a desirable attainment in education. The things that go to make up culture, those that are outside of the technical field, may be likened to the personal qualities. They are dependent upon the point of view and the attitude of the individual. College people whose favorite sport is to rearrange curricula seem to have the idea that all desirable attainments call for a formal course. Culture may embellish a technical course through the method of its presentation—largely by showing its relation to

other fields, economic and social. Conversely, a technical course narrowly presented may be stifling.

Now if students are to have a large cultural constituent, then the models of engineering (the professors) who are presented to them for emulation should themselves be the embodiment of the technical and cultural qualities incident to the real engineer. The important thing to implant in the student is the habit of taking a wide view of things both technical and cultural; also an interest which will lead to his own pursuit of those qualities which are characteristic of the broad-gauge scientific man.

Culture is not a course; it is an attitude.

Mr. Ole Singstad: (By letter)—I would like to suggest that you ask Dr. Hotchkiss if he will not be good enough to do what President Comfort did, namely, to suggest the subjects for a four-year high school course which Dr. Comfort gave as follows:

> English, 4 years; Latin, 4 years; Mathematics, 4 years; Modern Language, 2 years; History, 1 year; Laboratory Science, 1 year.

It is my opinion that this would add to President Hotchkiss' very splendid address.

Dr. Hotchkiss: (By letter)—With regard to the high school curriculum, I cannot agree with Dr. Comfort that every student should have four years of Latin and four years of mathematics. For most students this could be cut to much less with great saving in the precious time for schooling. So please make my excuses to Mr. Singstad and tell him I cannot do as he would like.

Mr. Edwin F. Wendt: (By letter)—I agree with Professor Hardy Cross of Yale University, "that there is no substitute for a good general education in any walk of life." I studied Latin for five years, Greek for five years, and the Bible for five years; I now realize more than ever the advantages of those courses as well as literature, logic, psychology, moral philosophy, political science, history, mathematics, physics, mechanics, astronomy, geology, anthropology, etc. I have great respect for Latin and Greek grammar. What an engineer needs is breadth of knowledge as well as technical information. He requires imagination and thorough preparation for his social responsibility. The engineer is more than a technician, he is a professional man; he promotes the public welfare.

Prof. H. E. Wessman: (By letter)—I have particularly

enjoyed the sequence of subjects presented by the speakers of the evening. It is important and significant that a man in the position of Dr. Hotchkiss should emphasize to us the cultural values in engineering, for its seems that college presidents are often prone to overlook this and speak solely in terms of the humanities or social sciences. I believe that engineers generally will not question the cultural value in the study of Latin, even though they know little or nothing about it. On the other hand, there are intelligent, honest, and sincere engineers, who seem to feel that culture is a virtue or quality which has nothing in common with technical matters and is solely to be found or acquired by a study of the classics. It is consequently both stimulating and encouraging to have Dr. Hotchkiss remind us that an engineer is by no means an outcast in circles of intellectual refinement. There are, of course, different interpretations of what is meant by "culture." I will not attempt to define this indefinable quality. But I venture to say that there is as much culture associated with the conception, design, and execution of a beautiful bridge or a parkway system, or a power plant, or a radio set as is associated with an intimate knowledge and appreciation of Cæsar and Cicero, or the works of Shakespeare, or the music of Mozart.

Several weeks ago, it was my privilege to hear Mr. John C. Parker, Vice-President of the Consolidated Edison Company of New York, speak to a group of engineers and engineering teachers on the subject, "This Culture." I would like to close this brief discussion by quoting one of his paragraphs:

"It was my good fortune as an undergraduate to take courses in structural analysis with a great teacher whom I recall as the inventor of the method of area moments for the graphical analysis of trusses and arches. The man loved his subject. Some of that affection communicated itself in his teaching. It is true it was a course in civil engineering. Equally truly, it was a course in which we learned something of a universe of law and order, in which we gained confidence that there were no closed mysteries that could not be solved by a modest but persistent mind. It meant something to us that the great arches which some day will support the central tower of the Cathedral of Saint John the Divine have their very being in a different but equal beauty in the method of area moments. A course in geology given to us as vocational foundation was so divinely inspired that the mountains, the hills and the streams will always add beauty to the landscape because they are full of meaning in a structural sense."

APPENDIX

Report of the Secretary

The Institute mourns the death of four of its members during the past year: Wilbur J. Watson, of Cleveland, at 68 years of age; J. Vipond Davies, of New York, at 77 years; George E. Beggs, of Princeton, at 56 years; and Francis C. Shenehon, of Minneapolis, at 78 years. Mr. Watson was an authority on bridge design and construction as well as on the architecture and engineering of factory structures. His practice extended beyond the boundaries of his city and state. Mr. Davies, born and educated in England, came to this country in 1889 and became a pioneer in the engineering and construction of tunnels under the Hudson River. He was identified with railway construction in Virginia, dam construction in Tennessee, electric power development in Mexico, and tunnel construction in Michigan, Colorado and other parts of our country. He was a Charter Member of the Institute and served twice on its Council. Professor Beggs was the head of the civil engineering department of the School of Engineering, Princeton University. He served as consultant on important bridges in various parts of our country. Shortly before his death he was elected Chairman of Engineering Foundation. He served two terms on the Council of the Institute. Mr. Shenehon was an engineer of note, whose examination of water power took him to Norway, Sweden, Germany, Austria and Switzerland, as well as to various points of the United States. Much of his practice was in the Great Lakes system, embracing St. Marys, Niagara and St. Lawrence Rivers, and the Sanitary District of Chicago. From 1909 to 1917 he was Dean of the College of Engineering, University of Minnesota.

Six new members have been admitted: Theodore Baumeister, Jr., New York; Charles E. DeLeuw, Chicago; Gustavus J. Esselen, Boston; Thorndike Saville, New York; Charles F. Scott, New Haven; and H. M. Waite, Washington, D. C. We now have a membership of 126 compared with 124 last year.

The principal activities of the Council were:

January 17: The annual report of the Secretary and Treasurer was approved. Officers were elected for the ensuing year: President, Dugald A. Jackson; Vice-Presi-

dent, James Forgie; Secretary and Treasurer, Philip W. Henry. Standing committees were appointed. An important report of the Development Committee on engineering audits was submitted, and its recommendation by Chairman Diehl was adopted to set aside the next three monthly luncheons for discussions of this subject. Messrs. Frederic J. LeMaistre and C. E. Myers were appointed to represent the Institute at the Forty-third Annual Meeting of the Academy of Political and Social Science, Philadelphia, March 31-April 1, 1939.

Mr. Lavis in a letter called attention to a recent article in the New York *Herald Tribune* which stated that "The Supervising Professional Engineers Union has been organized by the American Federation of Labor, and under its charter organized labor will not function on any project on which a professional engineer, a member of the new union has not been employed." The Secretary was directed to investigate.

February 1: The Council recommended that its New York State members write to their Senators and Assemblymen in opposition to Senate Int. 22 which limited the powers of any civil division of the state to employ consulting engineers except under unusual conditions.

Mr. Shortridge Hardesty was appointed to represent the Institute at the meeting of the Construction League of the United States at a meeting held at the Engineers' Club, New York, February 15, 1939.

Colonel Perring spoke of the benefits to be derived from a Federal registration law for engineers.

Messrs. James Forgie and William B. Poland were appointed to represent the Institute at the Symposium on Transportation held by the Franklin Institute, Philadelphia, February 7, 1939.

The Secretary reported that under date of January 24 he had sent to the membership copy of letter from Alfred E. Roche, President, New York State Society of Professional Engineers severely criticiz-

ing one of its members for forming the Supervising Professional Engineers' Union under the auspices of the A. F. of L. to which attention was called by Mr. Lavis at the Council Meeting of January 17.

March 1: President Jackson reported that he had written February 25 to William O. Douglas, Chairman, Securities and Exchange Commission, stating that the Institute would be glad to appoint one or more members to attend hearings on audit procedure.

Upon authorization by the Council, the President appointed Messrs. Maurice R. Scharff and George W. Burpee as such representatives. Copies of President Jackson's letter to Mr. Douglas were sent to the membership.

Mr. Hardesty reported on his attendance at the meeting of the Construction League, and Mr. Forgie on the Symposium on Transportation.

Chairman Burpee of the Committee on Legislation stated that his committee had under consideration four bills that had been introduced into the New York State Legislature and that affected engineers.

Colonel Perring reported letters he had written to the Executive Secretary, National Council of State Boards of Engineering Examiners, in regard to federal registration of engineers.

April 5: The Secretary reported that as a result of President Jackson's letter of February 25 to Chairman Douglas of the Securities and Exchange Commission, Messrs. Scharff and Burpee had a conference with Mr. William W. Werntz, Chief Accountant of the Securities and Exchange Commission in New York, on March 10 in regard to engineering audits. Copy of the letter of March 29 from Messrs. Scharff and Burpee to Mr. Werntz, together with accompanying memoranda, were ordered sent to the membership.

May 3 Mr. Burpee reported that he had attended a public hearing of the Securities and Exchange Commission during its investigation of the McKesson & Robbins matter, in which he introduced a statement with five

exhibits, practically those which were attached to the minutes of the Council Meeting of April 5.

There is no doubt that the discussion of engineering audits at the February, March and April meetings, leading up to the correspondence by President Jackson with Chairman Douglas of the Securities and Exchange Commission, and conferences with Chief Accountant Werntz by Messrs. Scharff and Burpee has resulted in a higher appreciation by all concerned of the services that engineers can render in the auditing of plant and operating accounts.

Colonel Perring reported that in regard to federal licensing of engineers he had had considerable correspondence; and the discussion that is taking place may lead to reciprocity among the different states, if not to federal licensing itself.

June 7: At the luncheon of members that preceded the meeting of the Council, President Jackson presented to Mr. Henry a testimonial in recognition of his fifteen years' service as Secretary. This testimonial, beautifully initialed and engrossed, had been prepared by a committee composed of Messrs. Dolan, Davies, Diehl and Forgie.

The Secretary reported that under date of May 11, Commander C. L. Gardner, Chairman, Federal Board of Surveys and Maps, had expressed appreciation of the position taken by the Council with respect to federal mapping.

September 6: The Secretary reported that under date of August 4 he wrote to John M. Carmody, Administrator, Federal Works Administration, protesting charges paid for engineering services, in accordance with the recommendation of the Committee on Professional Practice and Ethics, of which Mr. Hammond is Chairman. Replies were received from Mr. Carmody, as well as from Col. E. W. Clark, Acting Commissioner of Public Works. Copies of this correspondence were sent to the membership. The Secretary reported that he had sent to the membership copies of an act passed by Congress, H.R. 4278,

authorizing the Secretary of the Navy to employ outside engineers and architects "whenever deemed by him to be advantageous to the national defense."

October 4: Mr. Burpee, Chairman, Committee on Legislation, presented the committee's report on Patent Office administration, copies of which were sent to the membership. The original was sent to Mr. T. P. Reynolds, Acting Secretary of the Patent Office Advisory Committee of the Department of Commerce.

November 1: The Secretary presented a questionnaire from American Engineering Council in regard to the contributions that the members of the Institute are making in the solution of municipal, state and national problems. Copies of this questionnaire were sent to the members for their personal answers.

December 6: Messrs. Armstrong, Baird and Needles were appointed to represent the Institute at a conference called by the American Society of Civil Engineers to formulate a schedule of classification and related salaries for engineers.

The speakers and subjects at dinner and luncheon meetings were as follows:

January 16: Annual Dinner Meeting held at the University Club, 1 West 54th Street, New York, had, as its chief speaker, Sir Charles Morgan-Webb, the title of whose entertaining address was "An Englishman Looks at Europe." Sir Charles spent most of his active life in Burma, successively as Settlement Officer, Census Superintendent and Chief Secretary of the Government. He was in later years Vice-Chancellor of the University of Rangoon and Chairman of the Rangoon Development Trust. After retiring to England, Sir Charles devoted his attention to monetary affairs and published several books on the subject. He also made a study of international affairs in general.

February 1: All luncheon meetings were held at the City Midday Club, 25 Broad Street, New York, at 12.30 p.m. One of the guests at this luncheon was Mr. Donald

MacDonald, who had been connected with railway development in Alaska. He told of the International Highway which is being built from Seattle to Fairbanks under the direction of the International Highway Commission, of which he is a member. The luncheon was devoted chiefly to a discussion on engineering audits led by Messrs. Diehl and Burpee, copies of whose timely remarks were sent to the membership.

March 1: This luncheon meeting was again devoted to the discussion of engineering audits led by Messrs. Ammann and Singstad and participated in by Messrs. Burpee, Lavis, Diehl, Jenny, Hadden, Needles and Hubbell. Copies of this discussion, as taken down by a reporter, were sent to the membership.

April 5: This luncheon was also devoted to a discussion on engineering audits under the leadership of Mr. C. Oliver Wellington, a well-known accountant, and in which Messrs. Diehl, Burpee, Hubbell, Needles, Bakenhus and Forstall took part. Copies of Mr. Wellington's address, together with the remarks that followed (taken down by a reporter) were sent to the membership.

May 3: At this meeting Colonel U. S. Grant, 3d, Chief of Staff, Second Corps Area, made an excellent address on "The Engineers' Part in National Defense."

June 7: The speaker was Colonel H. L. Hall, District Engineer in New York, War Department, who spoke on "Some Troubles of a District Engineer."

September 8: Mr. Norbert A. McKenna, of Eastman, Dillon & Company, spoke of his recent experiences in England, France and Germany, a summary of which was sent to the membership.

October 4: Mr. R. B. Gaither, for many years a resident in Mexico, spoke on "Recent Developments in Mexico," copies of which were sent to the membership.

November 1: Mr. John Mills, Director of Publication, Bell Telephone Laboratories, was most original and entertaining in his address on "Communicating with Electrical Brains."

December 6: The speaker was Hon. Thomas C. Desmond, who told about the Public Efficiency Bill, which, as State Senator, he had sponsored in the Senate. Mr. Diehl, Chairman of our Development Committee, has called this the Model Consulting Engineers' Law. A summary of this important address was sent to the membership.